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SWIVEL WHEEL MOUNTING

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2 Sheets-Sheet 1

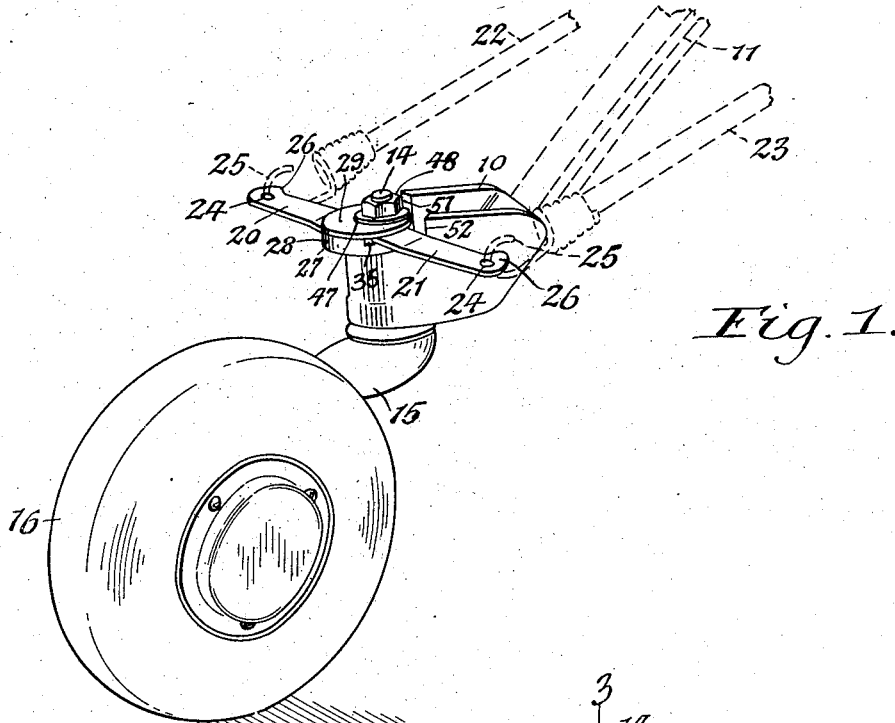


Fig. 1.

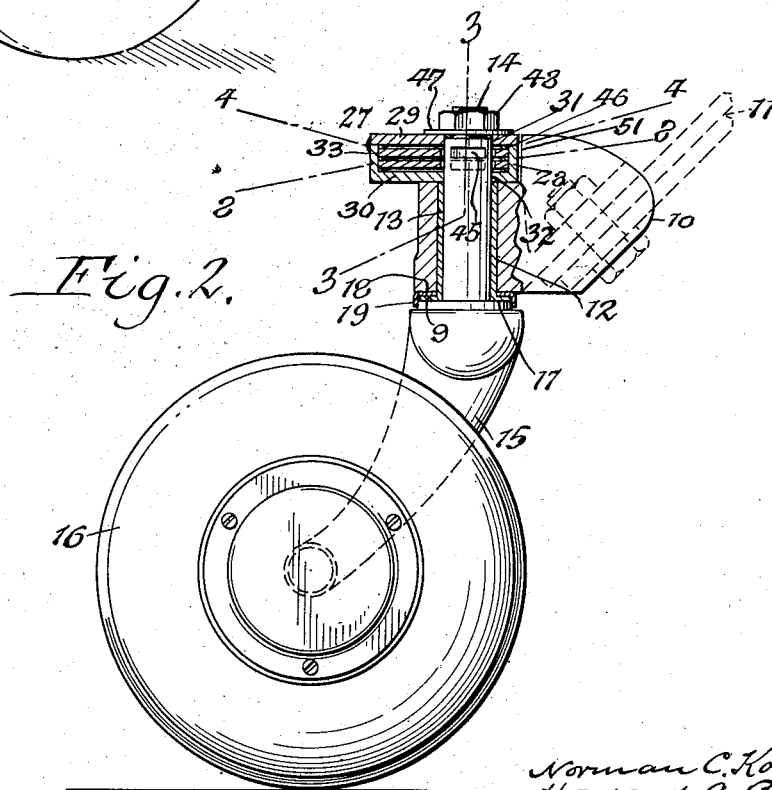


Fig. 2.

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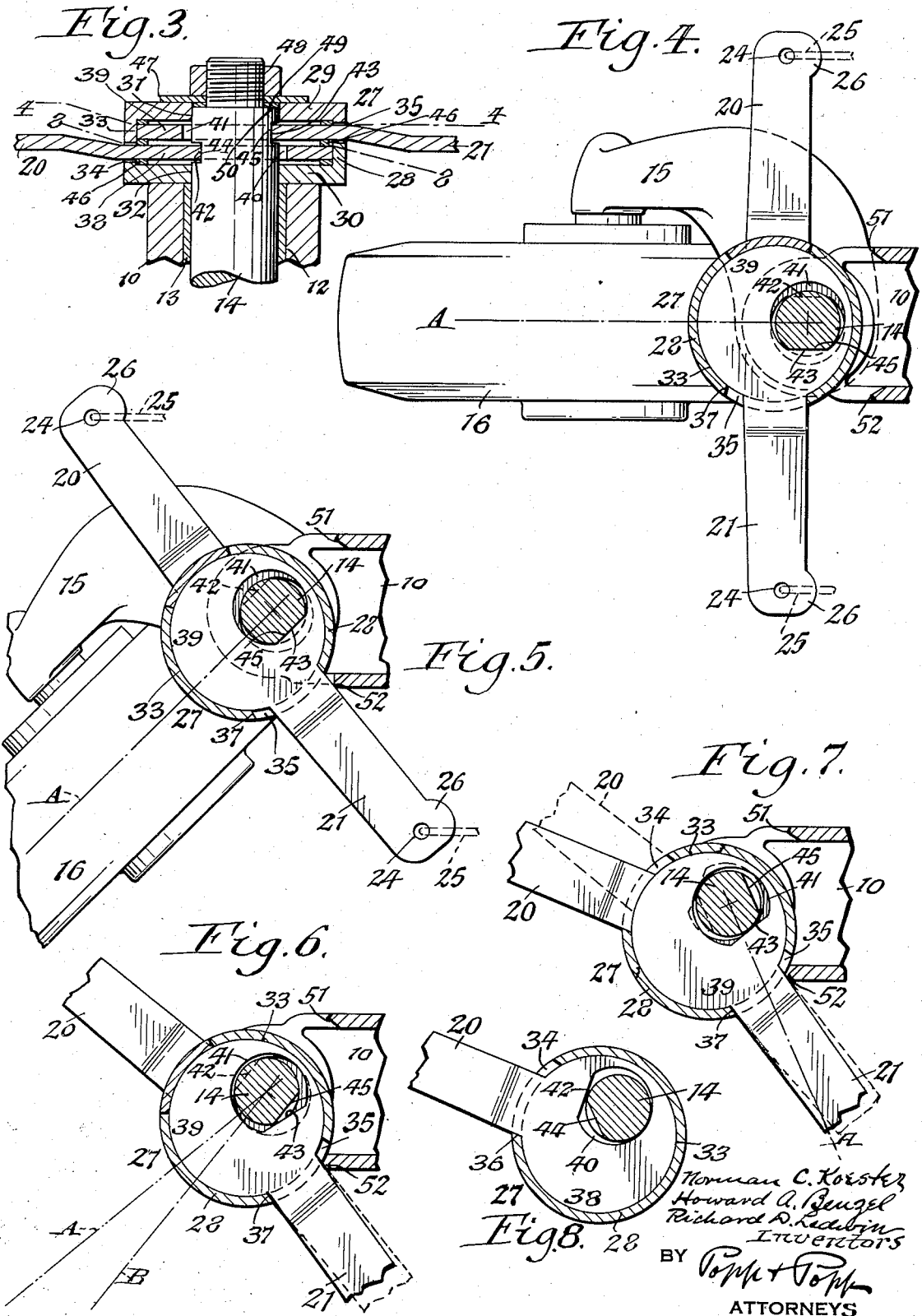
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2 Sheets-Sheet 2



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SWIVEL WHEEL MOUNTING

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14 Claims. (Cl. 244—50)

This invention relates to a swivel wheel mounting which is more particularly intended for mounting tail wheels, nose wheels and the like on flying machines to facilitate maneuvering the same while on the ground.

Mountings for this purpose have heretofore been provided which permitted the flying machine to be steered by manually operated control wheels while running on the ground or field either when taking off or landing and the same also permitted of unlocking these wheels from the control means so that they could turn freely without being restrained by control means and thus facilitate parking the machine.

The object of this invention is to provide improved means for interlocking such wheels and the control means to permit of manually steering the flying machine on the ground and also unlocking the same so that these wheels are free to turn independently of the control means when required, the purpose of these improvements being to render the mounting more durable and compact in construction and more efficient and reliable in operation.

In the accompanying drawings:

Fig. 1 is a perspective view of a swivel wheel for the tail of a flying machine embodying this invention.

Fig. 2 is a side elevation, partly in section, of the same on an enlarged scale.

Fig. 3 is a fragmentary vertical cross section, on a still larger scale, taken on line 3—3, Fig. 2.

Fig. 4 is a horizontal section, taken on the correspondingly numbered lines in Figs. 2 and 3, and showing the parts in a position in which the swivel wheel is in its central position and interlocked with the manually operated control means whereby this wheel may be steered by the aviator.

Fig. 5 is a similar view showing the position which the parts occupy when the wheel is turned to the limit toward one side of its central position and still remains coupled with the hand operated control means.

Fig. 6 is a similar view but showing the parts in a position in which the turning movement of one of the steering arms has been arrested and uncoupled from the pivot pin which turns with the wheel.

Fig. 7 is a similar view showing the wheel turned laterally still further from its central position and both of the steering arms uncoupled from the pivot pin of the wheel and thereby permitting of free rotation or freewheeling of the wheel independently of the control means.

Fig. 8 is a fragmentary horizontal section, taken on lines 8—8, Figs. 2 and 3, but showing the parts in a position corresponding to those shown in Fig. 7.

In the following description the same refer-

ence characters indicate like parts in the several figures of the drawings.

Although this invention is applicable to swivel wheels in various installations the same is shown in the drawings in connection with the tail wheel of a flying machine as an example of a practical use of the same.

In these drawings the numeral 10 represents a bracket which may be connected with the fuselage by any suitable means, such for example as an inclined bar or leaf spring 11 which is attached at its rear end to the bracket and at its front end to the tail of the fuselage. In its rear part the bracket is provided with a vertical bearing opening 12 of tubular form which is preferably lined with a tubular bearing bushing or sleeve 13 of bronze or the like and has an external thrust flange 9 at its lower end which extends laterally from this bushing and along the underside of the bracket.

The numeral 14 represents an upright spindle, pivot pin or steering post which rotates in the bearing bushing of the bracket. From the lower end of this pin a supporting arm 15 projects downwardly and laterally and has pivotally mounted on its lower end a swivel or steering wheel 16 adapted to run on the ground or field and trail from the bracket in the manner of a caster. The upper end of the supporting arm is enlarged to form an upwardly facing thrust shoulder 17 which bears against the underside of the thrust flange 13 of the bearing bushing.

In order to prevent the entrance of any dust or dirt into the joint between the periphery of the steering pin and the bore of the bearing in the bracket a dust cap is provided which has a horizontal inner retaining flange 18 interposed between the thrust flange 9 and the underside of the bracket and a lower guard flange 19 projecting downwardly from the outer edge of the retaining flange 18 and extending across the joint between the thrust flange 9 and the thrust shoulder 17 of the supporting arm 15, thereby excluding foreign matter from contact with the relatively rotating surfaces on these parts of the wheel mounting and preventing the same from wearing unduly.

The numerals 20 and 21 represent two steering or operating arms which are arranged on opposite sides of the steering pin and are operatively connected by operating cables or lines 22, 23 with a pedal or foot lever actuated manually by the aviator for steering the flying machine. The connection between each of these cables and the respective steering arm is preferably effected by providing the latter with an opening 24 at its outer end which receives a hook or loop 25 on the end of the respective cable. Each of these arms is provided on that side thereof toward which it is pulled by the respective cable with an

extension or widened portion 28 which is cross-wise in line with the opening 24 in this arm and thereby provides increased surface or body which will last longer before this opening is worn to the edge of this arm and thus necessitate less frequent renewal.

The improved means which embody this invention and whereby the steering arms and the steering pin or spindle may be coupled to permit of turning the steering wheel by operation of the manual control means and to uncouple these arms from said spindle to permit free-wheeling of the steering wheel, are constructed as follows:

The numeral 27 represents a supporting head or carrier which is preferably constructed in the form of a hollow circular box or casing and which has a cylindrical side wall 28, a flat top wall 29 at the upper edge of the side wall and a flat bottom wall 30 at the lower edge of the same. This head rests with its underside on the upper side of the supporting bracket and the same is capable of rotating or floating on the steering pin or spindle by means of vertically aligned bearing openings 31, 32 formed, respectively, in the top and bottom walls of the supporting head. These bearing openings are eccentric to the axis of the supporting head and the latter is provided on the inner side of its side wall with a circular bearing 33 which is eccentric to the axis of the steering pin or spindle. On opposite sides of the supporting head its side wall is provided with segmental slots 34, 35 extending circumferentially of this head and the rear ends of these slots forming, respectively, stops 36, 37 for a purpose which will presently appear.

The numerals 38, 39 represent two disk-shaped hubs which are superposed and connected with the inner ends, respectively, of the steering arms 20, 21. These hubs are arranged within the supporting head and provided, respectively, with clearance openings 40, 41 which are sufficiently large to permit of slipping these hubs freely over this pivot pin or spindle. The circular periphery of these hubs engage with the inner eccentric bearing surface 33 on the side wall of the supporting head 27 and on opposite sides of the pivot pin or spindle the edge portions of the openings 40, 41 of the hubs are provided, respectively, with locking faces 42, 43 which are arranged eccentrically relative to the axis of these hubs and which are adapted to be engaged with and disengaged from corresponding locking faces 44, 45 on the opposite sides of the periphery of the steering pin. Each of these several locking faces is preferably made straight and tangential to the axis of the hubs of the steering arms of which they form a part. The locking faces on the steering pin are preferably formed at the bottom of the notches which are arranged in the periphery of this pin at different points in the length thereof, as shown in Fig. 3. The hubs of the steering arms are preferably spaced from each other and also from the top and bottom walls of the supporting head by anti-friction washers 46 for the purpose of enabling these hubs to turn freely in the supporting head and permit the locking faces of these hubs and the steering pin to be easily engaged and disengaged.

The supporting head and the parts mounted therein are secured in an assembled condition relative to one another and retained in the proper position on the supporting bracket by a retaining washer 47 applied to the reduced upper end of the steering pin and engaging the upper side of the

bracket, a screw nut 48 engaging a screw thread on the upper end of this pin, and a spacing washer 49 surrounding the narrow upper part of the steering pin and interposed between the underside of the retaining washer and an upwardly facing shoulder 50 on this pin, as best shown in Fig. 3.

The forward rocking movement of the steering arms is limited by stop means consisting preferably of stops 51, 52 arranged on the bracket in front of the steering pin and opposite sides of the axis thereof in position to be engaged, respectively, by the front sides of the steering arms 20, 21.

The operation of this invention is as follows:

In Fig. 4 the swivel wheel 16 and the several parts whereby the same is mounted on the supporting bracket are shown in the position which they occupy when this wheel is in its central position and under the control of the operator, as indicated by the centerline A which runs through the axis of the steering pivot or spindle and the vertical plane of the wheel and is parallel with the fuselage while the steering arms 20, 21 are arranged at right angles to the longitudinal center of the bracket, and the locking faces 42, 43 of both of the steering arm hubs are engaged with the locking faces 44, 45 of the wheel spindle 14 by the forward pull on the operating cables 22, 23.

While the swivel wheel spindle is thus interlocked with the steering arms the aviator has control of the swivel wheel and can turn the latter positively to a limited extent toward either side of its central position, this movement to the right being arrested by the right steering arm 21 engaging with the stop 52 on the bracket 10, as shown in Fig. 5, and this movement toward the left being arrested by the left steering arm 20 engaging with the stop 51 on said bracket. The turning of the swivel wheel toward one side or the other of its central position is effected by moving one of the operating cables forward and permitting the other cable to move in the opposite direction, in a manner well known in this type of wheel operating mechanism.

If the movement of the swivel wheel and the bracket relative to each other is continued a sufficient extent after either of the steering arms engages the respective stop 51 or 52, then the swivel wheel will be unlocked from the steering arms and is capable of being turned freely independently of the control mechanism a complete rotation from the place where it was disconnected from the control mechanism until it again returns to this place.

The operation of disconnecting the swivel wheel from the control mechanism and reconnecting the same is as follows:

Assuming that the swivel wheel has been turned to the right and the steering arms 20, 21 have been turned anti-clockwise until the right steering arm 21 engages the stop 52, as shown in Fig. 5; if now the turning of the swivel wheel in this direction is continued from the line A' in Fig. 6, which corresponds to the line A in Figs. 4 and 5, to line B in Fig. 6, the continued rotation of the spindle in the same direction while the rotation therewith of the floating head and the right steering arm is arrested by the stop 52 will cause the locking face 45 on the spindle to act as a cam and turn the floating head eccentrically in this same direction for a short distance so as to also disengage the locking face 43 of the right eccentric hub 39 from the cooperating locking face 45 on the spindle. This disengaging action

of the locking faces 43, 45 is completed and the right hub and steering arm are uncoupled from the spindle when the stop 37 of the floating eccentric head engages with the rear side of the right steering arm 21, as shown in Fig. 6. During this disengagement of the hub of the right steering arm from the spindle, this arm 21 is moved angularly backwardly from the position shown by dotted lines in Fig. 6 to the position shown by full lines in the same figure.

Upon continuing the rotation of the spindle and swivel wheel in the same direction the other locking face 44 of the spindle acts with a cam action on the locking face 42 of the left steering arm hub and causes the same to turn eccentrically relatively to the axis of the spindle and withdraw the locking face of this hub from the corresponding face 44 of the spindle, as shown in Figs. 7 and 8. During this action the left steering arm 20 is shifted angularly backward from the position shown by dotted lines in Fig. 7 to the position shown by full lines in the same figure.

The swivel wheel is now free to continue its rotation in the same direction until it again reaches its central or neutral position at which time the steering arm hubs will be snapped back into interlocking engagement with the wheel spindle by the forward strain on the operating cables and place the swivel wheel under the control of the operator.

Upon turning the swivel wheel toward the left beyond its normal position and then returned to this position, the action of the coupling means for connecting and disconnecting the spindle of the swivel wheel and the control mechanism is the reverse of that just described.

In the drawings the spindle is shown in front of the axis of the steering arm hubs but if desired this spindle may be arranged in rear of this axis and the other parts of this mechanism arranged accordingly and thus obtain the same result in substantially the same way.

We claim as our invention:

1. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms including a head pivoted on said pin to turn thereon and having a bearing which is eccentric to the axis of said pivot pin and surrounds the same, and hubs having concentric axes and arranged on said steering arms and turning on said eccentric bearing and having locking faces adapted to engage and disengage with locking faces on said pin.

2. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms including a head pivoted on said pin to turn thereon and having a bearing which is eccentric to the axis of said pivot pin and surrounds the same, hubs having concentric axes and arranged on said steering arms and

turning on said eccentric bearing and having locking faces adapted to engage and disengage with locking faces on said pin, stops arranged on said bracket and adapted to limit the turning movement of said arms, and stop means for limiting the relative movement of said head and arms.

3. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms, including a box-shaped head which is pivoted on said pin and provided with an internal bearing the axis of which is eccentric to the axis of said pin and surrounds the latter, and hubs arranged on said arms and rotatable on the internal bearing of said head and having locking faces adapted to engage and disengage with locking faces on said pin.

4. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms, including a box-shaped head provided with bearing openings in its top and bottom in which said pin turns and also provided with an internal bearing in its side wall which is eccentric to the axis of said pivot pin and surrounds the latter, and hubs arranged on the steering arms and turning in said internal bearing and provided with locking faces adapted to engage and disengage with locking faces on said pin.

5. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms including a box-shaped head provided with bearing openings in its top and bottom in which said pin turns and also provided with an internal bearing in its side wall which is eccentric to the axis of said pivot pin and surrounds the latter, and also having slots in its side wall which receive said steering arms, and hubs arranged on said steering arms and turning in said internal bearing and provided with locking faces adapted to engage and disengage with locking faces on said pivot pin.

6. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms including a

head pivoted on said pin and turnable thereon and having a bearing which is eccentric to the axis of said pivot pin and surrounds the latter, and hubs arranged on said steering arms and turning on said eccentric bearing having cam locking faces which are adapted to engage and disengage with cam locking faces on said pivot pin.

7. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms including a head pivoted on said pin and turnable thereon and having a bearing which is eccentric to the axis of said pivot pin and surrounds the latter, and superposed hubs arranged on said steering arms and provided with locking faces adapted to engage and disengage with locking faces on the pivot pin.

8. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms including a head pivoted on said pin and turnable thereon and having a bearing which is eccentric to the axis of said pivot pin and surrounds the latter, and superposed hubs arranged on said steering arms and provided on their opposing parts with cam locking faces which are adapted to engage and disengage with cam locking faces on opposite sides of said pivot pin.

9. A mounting for a swivel wheel comprising a pivot pin upon which the wheel is journaled, a bracket having a bearing in which the pin turns, control means for steering said wheel including steering arms arranged on opposite sides of said pivot pin, and coupling means whereby said steering arms and pivot pin may be interlocked so that they turn together or unlocked from one another to permit the wheel to turn independently of said steering arms including a head pivoted on said pin and turnable thereon and having a bearing which is eccentric to the axis of said pivot pin and surrounds the latter, superposed hubs arranged on said steering arms and provided with locking faces adapted to engage and disengage with locking faces on the pivot pin, and spacing washers interposed between the opposing surfaces of said hubs and head.

10. A mounting for a swivel wheel comprising a bracket provided with a vertical tubular bearing and a horizontal thrust bearing face on its underside, a pivot pin journaled in said tubular bearing and having a reduced upper part forming an upwardly facing upper shoulder thereon, a supporting arm arranged at the lower end of said pin and pivotally supporting said wheel and provided with a lower bearing shoulder engaging with said thrust bearing face, a box-shaped

head which rests on said bracket and through which the upper part of said pin passes and which has an internal bearing arranged eccentrically to the axis of said pivot pin, a screw nut arranged at the upper end of said pivot pin, a retaining washer interposed between said screw nut and said bracket, a spacing washer arranged between said retaining washer and said upper shoulder on the pivot pin, steering arms arranged on opposite sides of said pivot pin, and hubs arranged on said arms and rotating on said eccentric bearing and having locking faces engaging with locking faces on said pivot pin.

11. A mounting for a swivel wheel comprising a bracket having a vertical bearing opening, a bearing bushing arranged within said bearing opening and provided at its lower end with an external annular flange, a pivot pin which is journaled in said bushing and has a depending arm which carries said wheel and also has an annular shoulder engaging the external flange of said bushing, a cup-shaped dust cap having an inner horizontal retaining flange interposed between the underside of said bracket and the external flange of said bearing bushing and also having a depending guard flange which engages with the periphery of said external flange and the annular shoulder of said pivot pin and said depending arm, steering arms arranged on opposite sides of said pivot pin, and hubs arranged on said steering arms and turning in said eccentric bearing and provided with locking faces engaging with locking faces on said pin.

12. A mounting for a swivel wheel comprising a bracket provided with a bearing, a pivot pin journaled in said bearing and carrying said wheel, steering arms arranged on opposite sides of said pin, and coupling means for connecting and disconnecting said pivot pin and arms, the outer ends of said steering arms being provided with openings adapted to receive operating cables and each of said arms being provided on that side toward which it is pulled by one of said cables with an extension in line with the opening in the respective arm to provide increased wearing surface.

13. A mounting for a swivel wheel comprising a supporting bracket provided with a bearing, a spindle journaled in said bearing and carrying said wheel, a supporting head pivoted on said spindle and provided with a bearing which surrounds the axis of said spindle and is eccentric thereto, and a hub turning on the eccentric bearing of said head and provided with a steering arm and also having a locking face engaging with a locking face on said spindle.

14. A mounting for a swivel wheel comprising a supporting bracket provided with a bearing, a spindle journaled in said bearing and carrying said wheel, a supporting head pivoted on said spindle and provided with a bearing which surrounds the axis of said spindle and is eccentric thereto, steering arms arranged on opposite sides of said spindle, and hubs arranged on the opposing inner ends of said arms rotatable about said spindle and in engagement with said eccentric bearing, said hubs having locking faces engageable with locking faces on said spindle.

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